

4 OCTOBER 2016

AUSTRALIA (NT)

RARE EARTHS, PHOSPHORIC ACID

FEASIBILITY STUDY

EXCHANGE: ASX:ARU

**CAPITAL PROFILE**

Share price (A\$)	0.072
52 week range (A\$/share)	0.041 to 0.085
Number of shares (M)	441.3
Options and warrants (M)	12.0
Converting notes (M)	0.0
Fully diluted (M)	453.3
Market capitalisation (undiluted) (A\$M)	31.8
Debt (A\$M) - Sep 16F	0.0
Enterprise value (A\$M)	21.9
Major shareholders: East China Min Expl & Devel Bureau (ECE, 24.9%), JP Morgan Nominees (23.5%)	
Avg monthly volume (M)	5.2
Cash (A\$M) - Sep 16F	9.9
Price/Cash (x)	2.5
Price/Book (x)	0.3
Listed company options:	No



**DIRECTORS**

Ian Kowalick (Chairman)  
Gavin Lockyer ( MD)  
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Terry Grose (Non Exec Dir)  
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**ARAFURA RESOURCES LIMITED**

Lithium Overdone? Savvy investors are now latching onto other crucial clean energy inputs such as rare earths (REs) that should benefit from the huge projected future growth in electric vehicles. Arafura presents a prime opportunity for exposure to the anticipated upside in REs.

Share Price: A\$0.072

Speculative Buy

The recognition of the impending clean energy revolution in the global automotive industry is creating strong investor interest in sectors with upside leverage. With lithium it's all about efficient energy storage for electric vehicles (EVs). For crucial RE inputs, it is primarily about superior electric motor weight, performance and efficiency achieved using RE magnets (containing NdPr oxide). Accordingly, we think ARU (with a top-tier advanced NdPr project) should be a primary focus for investors looking for exposure to the anticipated NdPr price increases as demand from the clean energy sector accelerates.

**INVESTMENT POINTS**

- ◆ A looming supply deficit of magnet feed NdPr looks likely, due to increased demand from the clean energy sector.
- ◆ RE markets are dominated by Chinese production (~85%). Recent developments in China are likely to result in flat or reduced Chinese output.
- ◆ After a sustained period of low RE prices, we expect an uptrend in prices in the medium-term will stimulate investment in new non-Chinese production.
- ◆ Globally there is only one RE mining and processing project in operation outside China. The world's EV component suppliers will want increased secure, stable RE supply established in low geopolitical risk regions outside China.
- ◆ We think ARU's Australian-based Nolans Rare Earths Project is competitively positioned to become one of the new generation suppliers of NdPr.
- ◆ Nolans is underpinned by a world-class long-life NdPr resource. It is one of only a handful of projects that is well advanced in the lengthy feasibility study process.
- ◆ Recent reviews have seen projected opex and capex reduced dramatically. Projected unit costs per kg of NdPr are lowest in class for development projects and significantly lower than the current non-Chinese operation (ASX:LYC).
- ◆ The combined NdPr content of the ore and estimated process recoveries means that NdPr will generate 81% of projected revenue – higher than its development peers. This is of major strategic importance.
- ◆ The reduction in estimated capex from as high as US\$2bn five years ago to US\$680M in recent estimates dramatically reduces the project financing risk.
- ◆ An enterprise value of A\$22M suggests significant potential share price upside.

**COMPANY STATISTICS**

Year End June	Jun-16a	Sep-16F	2015a	2016a	2017F
Exploration and evaluation (A\$M)	1.36	1.15	7.81	5.64	5.35
Corporate (A\$M)	0.66	0.80	4.40	3.23	3.20
Exploration/(Expl.+ Corporate) (%)	67	59	64	64	63
Funding duration at current burn (years)			1.4	1.3	0.5
Shares on issue (pr end) (m shares)	441.3	441.3	441.3	441.3	441.3
Drilling - RAB (m)	0	0	0	0	0
Drilling - RC/Diamond (m)	0	0	0	0	0
Land holding ('000 ha)	196	196	196	196	196
Tenement costs (\$k per year)	-	-	-	-	-
Capital raisings (A\$M)	0.0	0.0	0.0	0.0	0.0
Funding from JV partners (A\$M)	0	0	0	0	0
Cash (A\$M)	11.5	9.9	16.6	11.5	4.1
Cash backing (Ac/share)	2.6	2.2	3.8	2.6	0.9
Net asset backing (Ac/share)	18.0	17.9	32.5	18.0	17.4

## COMPANY COMMENT

**Overview:** ARU's flagship is the advanced Nolans Rare Earths Project (Northern Territory, Australia). The Nolans deposit is 135km NNW of Alice Springs, and has Measured and Indicated JORC resources of 34.9Mt @ 2.79% total rare earth oxides (TREO) and 12.1% phosphate (P<sub>2</sub>O<sub>5</sub>). This is equivalent to over 970,000t of contained TREO. The current mine plan supports a mine life of >20 years at a production level of 14ktpa equivalent TREO. The project is world scale, and strategically important with a high content of potentially critical REs neodymium ("Nd") and praseodymium ("Pr") which will drive the economics.

### **Electric Vehicles and Wind Turbines to Drive RE Demand.**

When we talk of RE demand we are really focusing on one key RE component – NdPr oxide ("NdPr") which is a critical raw material input to permanent magnets that are essential in the development of permanent magnet synchronous motors found in most hybrid, plug-in hybrid and battery electric vehicles (EVs) and generators for wind turbines. NdPr magnets are about three times stronger and one tenth of the weight of conventional permanent magnets, and there is no known substitute to achieve similar performance.

As much as the lithium sector has been ignited by the projected rapid demand growth for lithium in relation to lithium-ion battery energy storage for the impending EV revolution, we see similar demand potential for NdPr being driven by the same revolution in EVs – cars, light duty vehicles and bikes. In the graphics on the following pages (pages 3 and 4) we have provided some snapshots summarising the expected demand growth coming from this sector. Demand growth of 10% CAGR looks readily achievable, which means that demand for NdPr could effectively double in the next 7-8 years (currently 36,500tpa).

**RE Supply – Diversifying away from China.** Currently about 85% of the world's REs comes from Chinese-sourced (sanctioned and illegal) supply. The graphic on page 4 indicates that Chinese supply of Nd oxide is likely to stabilise and probably reduce in the next few years. The reasons for this expectation are:

- (1) The Chinese Government is increasing efforts to regulate supply and control illegal production.
- (2) China is consolidating small RE producers into six large State controlled entities.

In addition, Chinese export quotas and tariffs have been replaced by resource taxes which are likely to lead to higher prices once existing stocks of RE are run down.

Coupling the Chinese supply outlook with the anticipated NdPr demand growth detailed above, it is not hard to see a looming supply deficit for NdPr feedstock in the next few years. The chart on page 4 indicates that the projected supply deficit for Nd oxide product would require at least three or four Nolans-sized projects to come online by 2020 to bridge the gap between projected demand and supply. Potential end-users of NdPr oxides, particularly those in the western world, will no doubt place great importance on security of supply when establishing offtake agreements as the demand from EVs and wind turbine manufacture grows. They will be particularly keen to enter into supply agreements with non-Chinese suppliers with mining and processing operations in stable, low sovereign risk countries, which is likely to underwrite the financing and development of RE projects in these jurisdictions. In this regard ARU's Nolans Rare Earths Project is one of the standouts, as demonstrated in the graphic on page 6.

### **Transforming Nolans Economics – Opex and Capex Reductions:**

A major review of the Nolans Project configuration and process design improvements (announced in late June 2016) resulted in what we consider to be a major transformation of the project and a resultant decrease in financing and development risk that puts it firmly at the top of the league table of potential new NdPr projects. Key to the review were:

- A 43% reduction in ROM mining rates from 922ktpa to 525ktpa.
- A 30% reduction in total RE output from 20ktpa to 14ktpa.
- A 32% reduction in NdPr oxide output from 5,260tpa to 3,601 tpa.
- Significant increases in RE recoveries, including NdPr.
- Removal of low value cerium carbonate at the Nolans operation in Australia rather than by solvent extraction in the offshore RE Separation Plant.

- Additional revenue generation from sale of merchant grade phosphoric acid co-product, from the 12-13% phosphate content of the resource.
- A reduction of 19% in capex from US\$835M to US\$680M
- A reduction of 28% in unit opex (after co-product credits) from US\$8.65/kg TREO to US\$6.23/kg of TREO.

The resultant reductions in capex and opex are major factors in reducing financing risk in the current risk-averse capital environment for most non-gold mining projects. Overall, as shown in the graph on page 5, the Nolans Project has been totally transformed from a relatively bloated ~US\$2bn capex, high opex project in 2012, when RE prices were still sky high, to a lean US\$0.7bn capex, low opex NdPr-focused project in the current proposed configuration. The benchmarking chart on page 5 indicates that projected unit costs for Nolans are now expected to come in at well under the levels currently reported for the Lynas Mt Weld-LAMP Project, which is the only current non-Chinese RE mining and processing plant operator. Admittedly, Mt Weld is still a relatively marginal operation at current RE prices, and may well struggle to meet looming debt servicing requirements without RE price rises, but ARU's lower unit costs and the strong possibility of NdPr price rises in the short-medium term will give potential financiers some confidence that ARU's Nolans Project is eminently financeable with an acceptable risk profile.

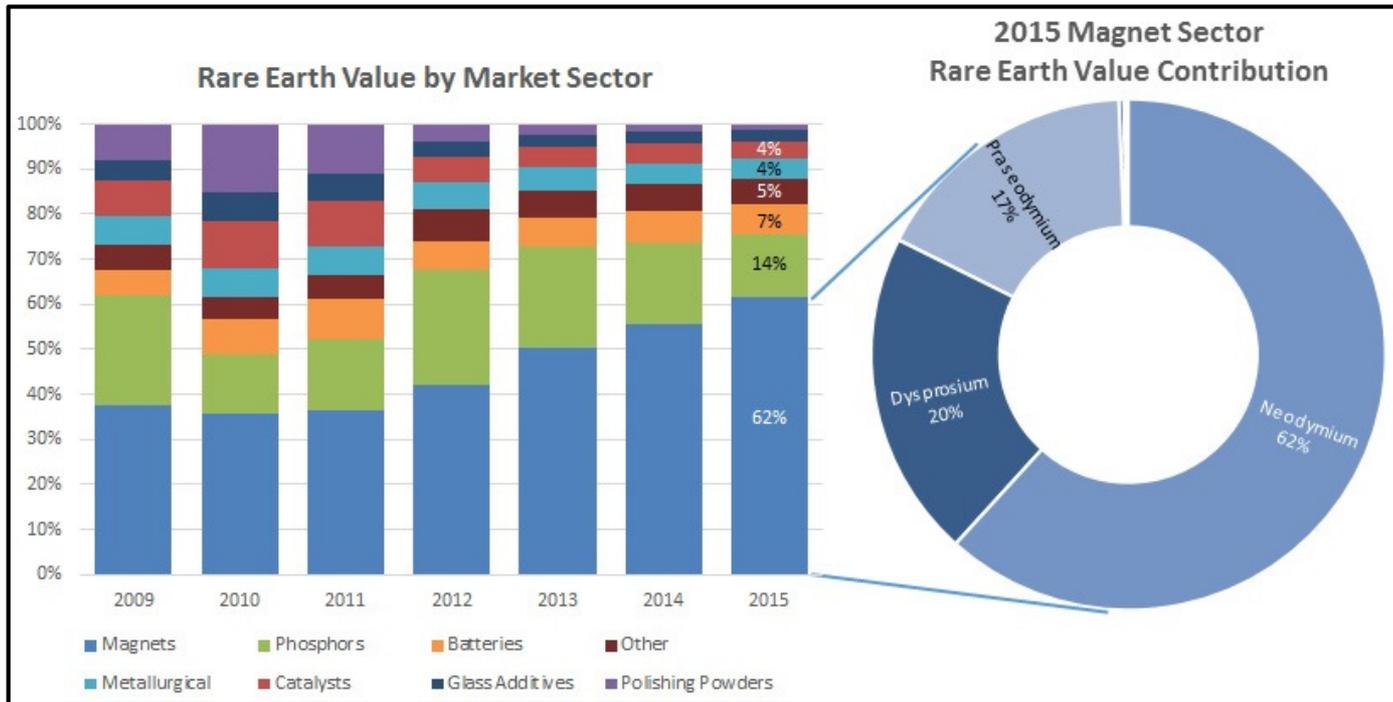
**Development Timetable:** The Nolans Environmental Impact Statement was lodged in May 2016. ARU is now proceeding to scope and tender engineering design of the revised configuration for final feasibility, as well as, in its own words, "escalate discussions with potential cornerstone investors, customers and financiers to align feasibility to their expectations." The on-going work in CY2016 and CY2017 is expected to include operation of pilot plants for ore beneficiation, phosphoric acid production and RE extraction and separation, finalisation of detailed flow diagrams and detailed engineering. The company envisages a final investment decision and go-ahead for the project in CY2018, meaning that we could see initial production by the end of CY2020. The Nolans Project has recently attained Major Project Facilitation (MPF) status with the Australian Government which will help speed approvals processes. We note that it is one of only 17 other significant development projects around Australia that have achieved MPF status.

**Corporate:** As at 30 June 2016 ARU's cash balance was A\$11.5M. The cash burn rate for project development, project evaluation and overheads has averaged A\$2.1M per quarter in FY2016 (A\$1.3M per quarter after R&D tax rebates). This rate may increase with pilot plant construction and operation in 2017, however we consider that there is unlikely to be a pressing need for a further capital raising until 1H18.

**Key 'Big Brother' Partnerships:** ARU has recently (January 2016) entered into a MOU with South Korean chemical giant OCI to establish a Joint Venture Rare Earth Separation Plant in in South Korea to toll process Nolans material. OCI also operates chemical plants in the USA, China and Europe. There are significant operational and financial benefits in co-locating the proposed JV RE Separation Plant near OCI's existing Gunsan chemical plant in South Korea. The MOU will assess the opportunity for joint funding and technical collaboration. ARU also has a very supportive major Chinese shareholder in ECE that has already injected A\$33M.

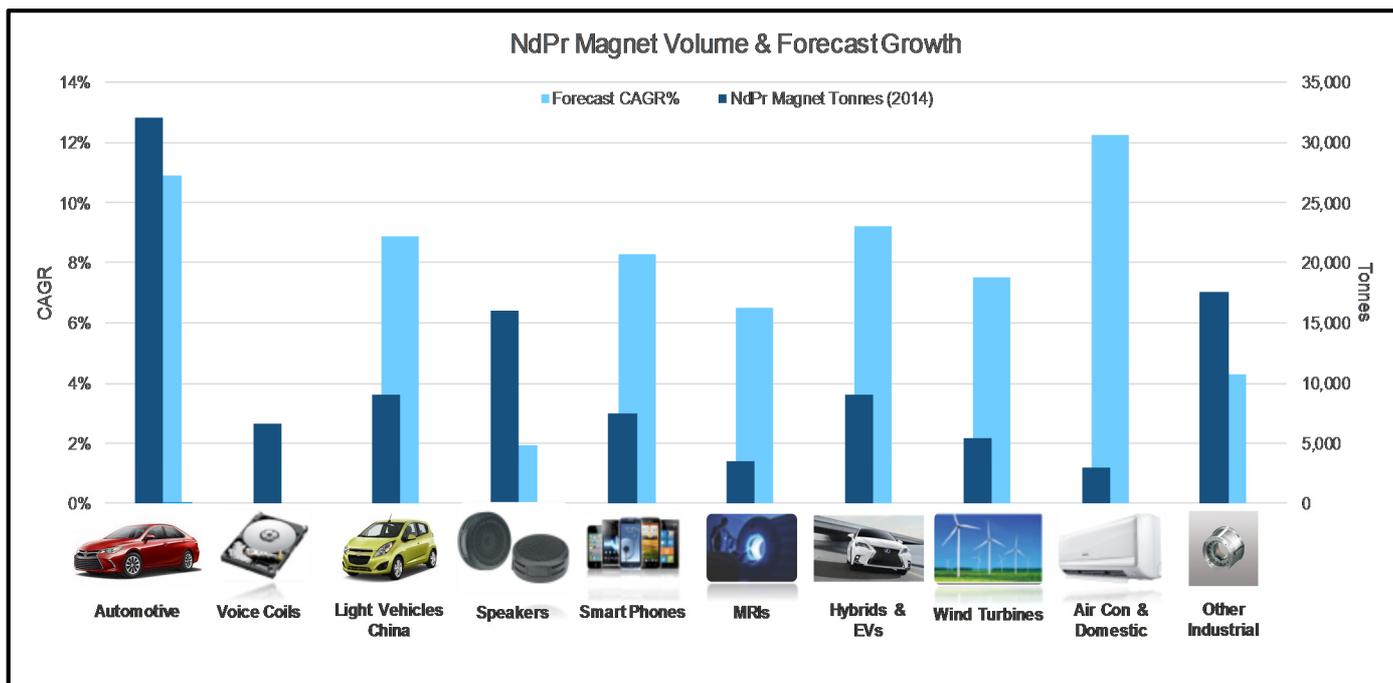
**Investment Comment:** We are seeing signs that share market investors are starting to spot a "lithium look-alike" in the magnet feed NdPr RE sector, despite prices for REs including NdPr having remained subdued in CY2016. Importantly, after the transformation of the project economics underpinned by the June 2016 review, it is likely that ARU's Nolans Project will become a primary focus for investors seeking exposure to NdPr. We have already seen signs of this in the form of a share price spike in July 2016 (the ARU share price reached A\$0.083) and the issue of a "speeding ticket" from the ASX. Share trading volumes have also increased significantly since mid-July. With an enterprise value of only A\$22M, this is likely to be just the beginning.

The reason all aspiring RE producers are strongly focusing on NdPr as the key component of revenue is due to the demand for this feedstock from the clean energy-driven permanent magnet sector. This demand source has grown from 35% of RE sales in 2010 to 62% of RE sales in 2015 – and demand is expected to accelerate strongly.



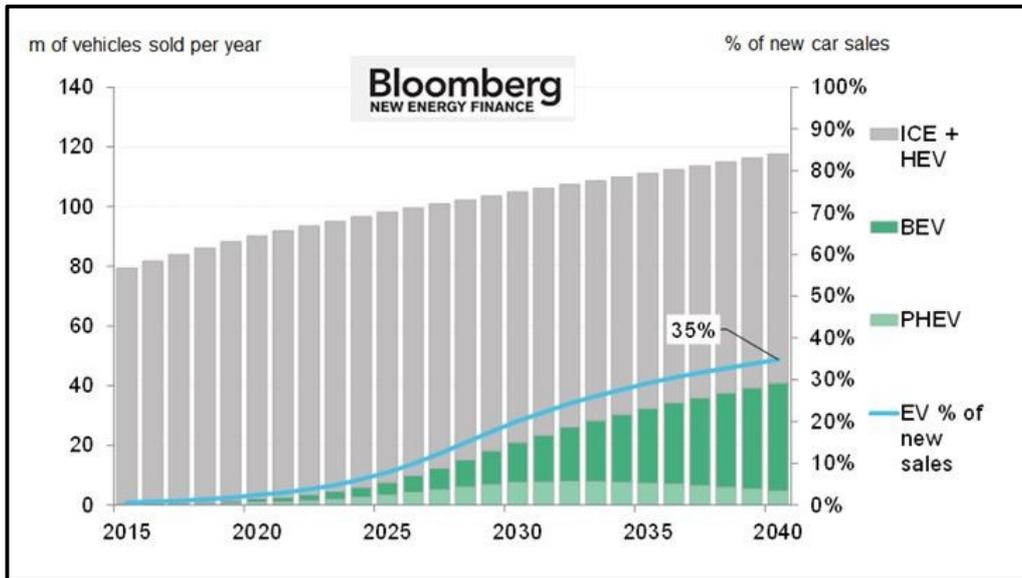
Source: Adamus Intelligence, IMCOA, Roskill, Shanghai Metals Market

The graphic below summarises the expected strong demand growth for NdPr permanent magnets by demand sector. Five of the demand sectors have a forecast compound annual growth rate (CAGR) in excess of 8%. In terms of increases in tonnage demand, the strongest growth will be derived from the automotive sector with 11% forecast CAGR coming from a base of over 30,000 tonnes of NdPr magnet demand in 2014. In the case of EVs it is not just cars – China is expected to produce 30 million electric bicycles in 2017.



Source: Adamus Intelligence, Arnold Magnetic Technologies, Japanese industry participants, Roskill

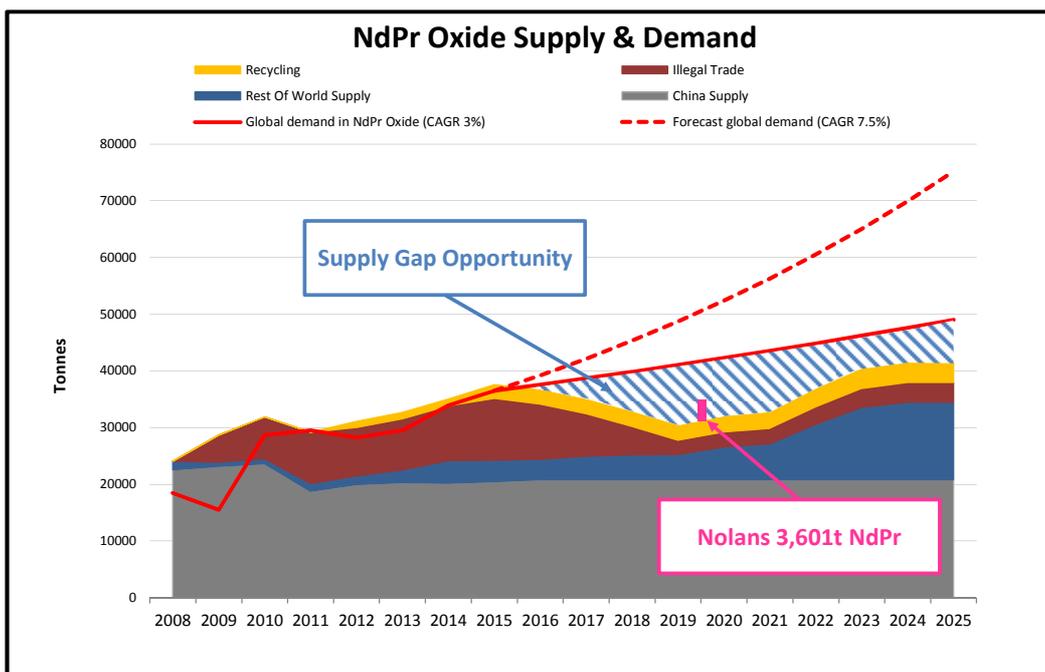
The expectations of the transformation of the automotive industry through increasing adoption of clean energy EVs is primarily what has been driving the massive interest in lithium as a key input to lithium-ion batteries. EV sales are forecast to be 35% of total vehicle sales (>30 million vehicles per year) by 2040. In 2015 EV sales accounted for less than 1%. Other short-supply feedstocks such as cobalt are also starting to generate excitement. We believe we will soon start to see the same supply-shortage dynamics gaining increasing recognition in relation to NdPr rare earths as an essential component of the high-performance permanent magnets required in the motors that drive these vehicles.



Note: LDV = light duty vehicles; EV = electric vehicles; ICE+HEV = internal combustion engine and hybrid vehicles; BEV = battery electric vehicles; PHEV = plug-in hybrid electric vehicles.

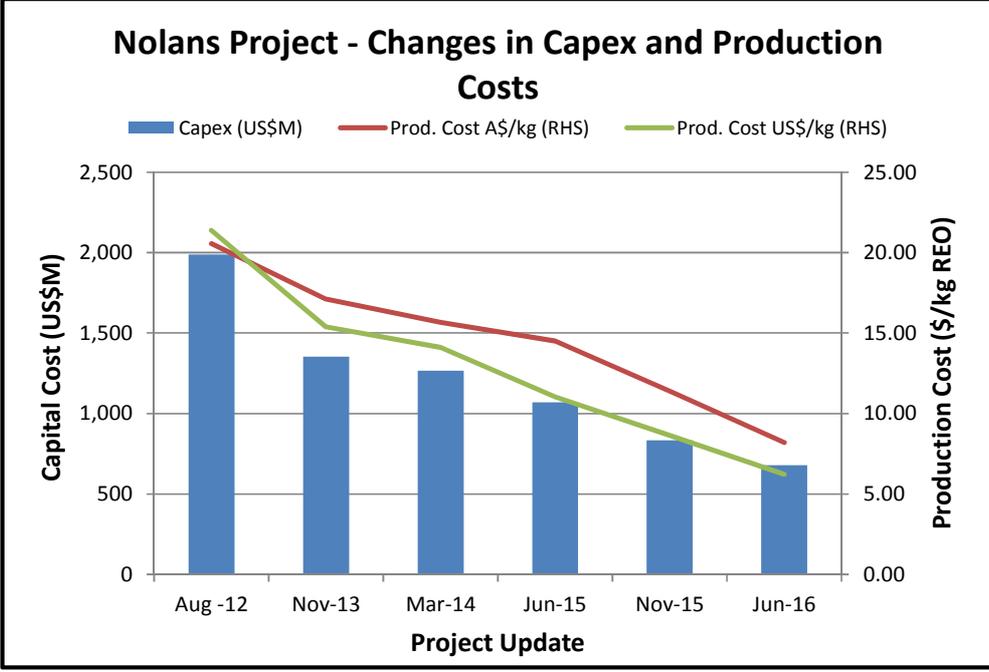
Source: Bloomberg New Energy Finance

The forecast looming supply gap in the NdPr sector will be created by strong demand growth, flat “official” Chinese output and the anticipated reduction in illegal production coming from China. US, Japanese and European EV manufacturers will be very keen to see additional supply coming from non-Chinese sources. Currently Lynas Corporation (ASX:LYC) is the only substantial western world supplier of NdPr.

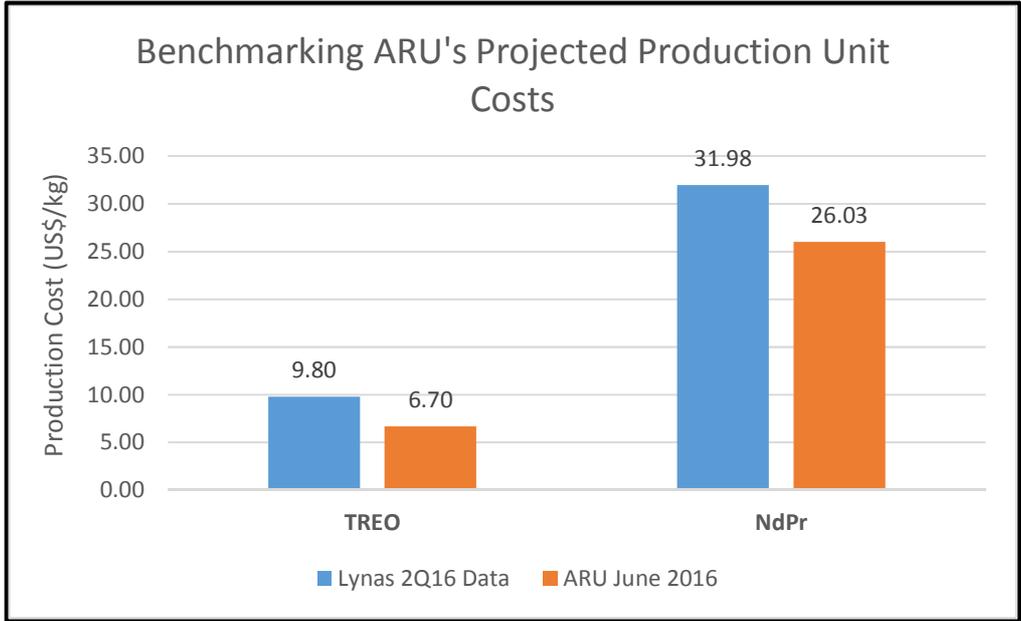


Source: ARU

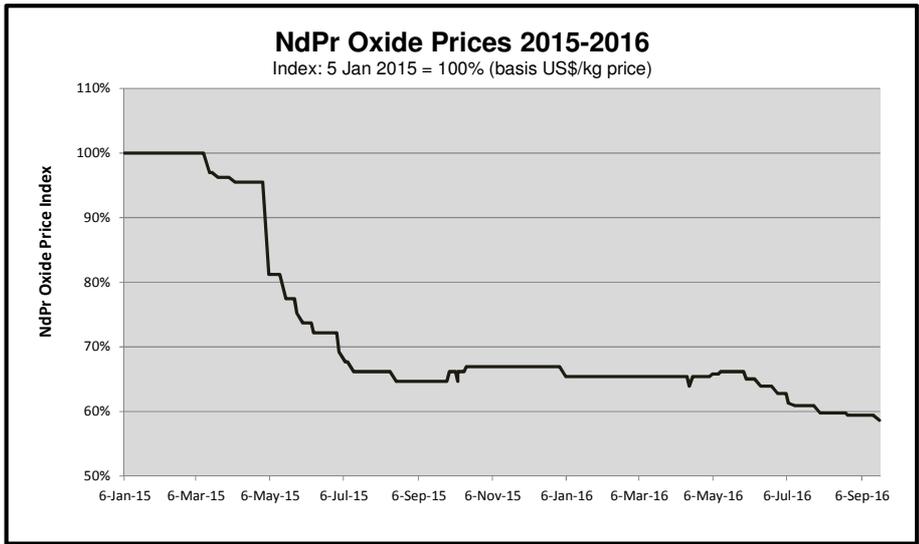
The graph below demonstrates how the Nolans Project has been transformed into a highly competitive low cost project through major reductions in projected capex and operating costs. The original estimated opex of >US\$20/kg TREO (August 2012) has been slashed to US\$6.23/kg in the most recent review (June 2016), driven by major process efficiency gains and inclusion of phosphoric acid co-product credits. The original projected capex of around US\$2billion (August 2012) has plummeted to US\$680million through rationalisation of the flowsheet and plant configuration, and, (in the most recent review – June 2016), reducing the projected throughputs to downscale to a more modest 14,000tpa TREO versus 20,000tpa TREO in the previous configurations. Projected ROM feed has been reduced from 922ktpa to 525ktpa.



We have compared ARU's projected unit costs per kg TREO (including admin & overheads) with those of Lynas Corporation (ASX:LYC) - the western world's only current supplier of mined and processed rare earths. In terms of US\$ per kg of TREO output ARU's projected unit costs are 32% lower. In terms of US\$ per kg NdPr product, ARU's projected costs are 18% lower.



Source: ARU; LYC June 2016 quarterly report



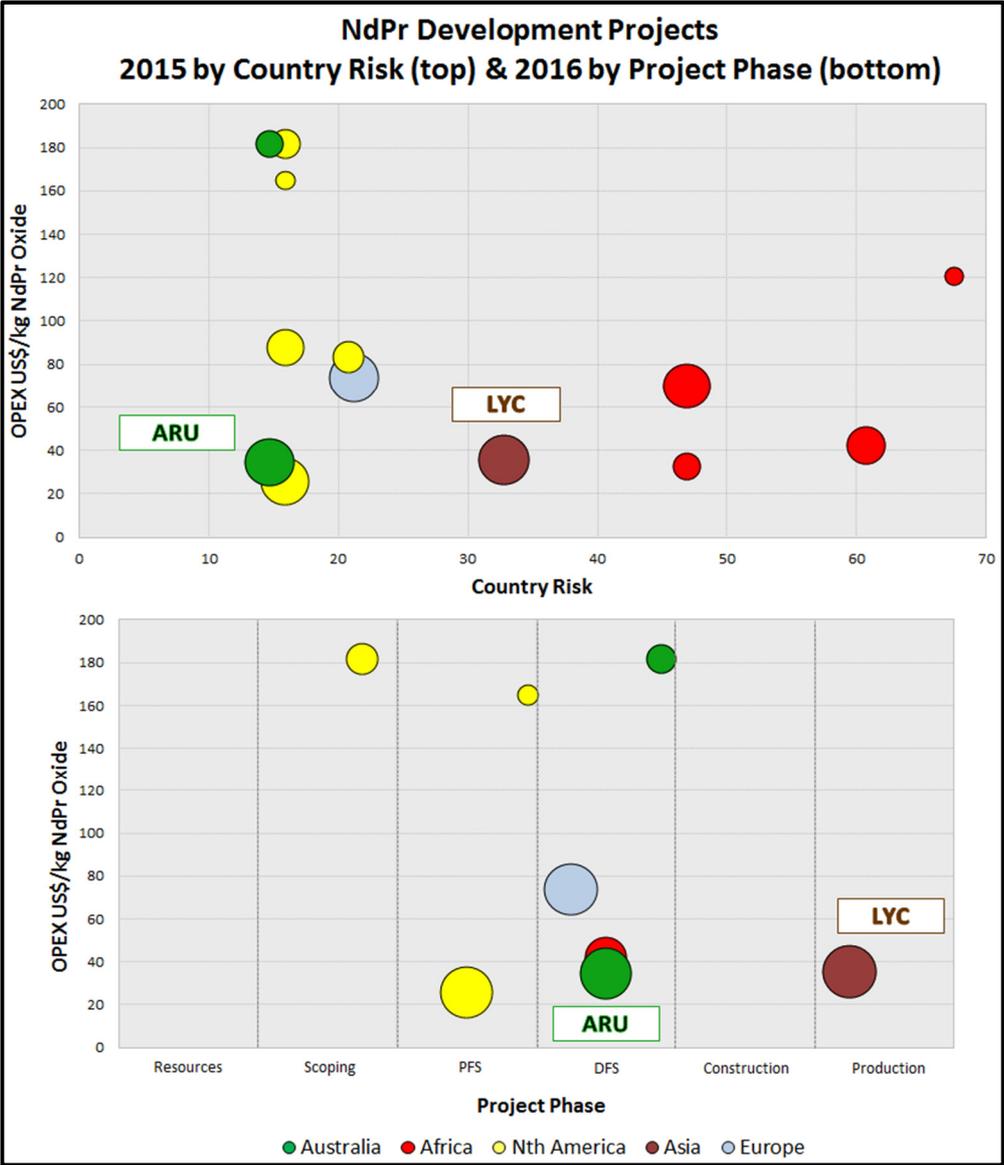
Source: ARU and Metal-Pages (an Argus Media company)

No excitement – yet! NdPr oxide prices have remained relatively subdued in CY2016 (in fact have weakened further in recent months) as the Chinese industry continues to rationalise and closure of illegal production is targeted. As this process progresses and a demand-induced supply deficit is anticipated, we would expect a price uptrend to be established in the next 6-12 months. This would reverse the debilitating price downtrend evident since prices spiked at many times current levels in mid-2011 due to the then temporary Chinese export restrictions.

The major advantages of ARU’s Nolans Project in terms of operating costs, operating jurisdiction and advanced development status are highlighted in the graphic on the right.

Additionally, ARU’s project exhibits very high leverage to the high growth magnet market through its key NdPr product that will generate an estimated 81% of projected revenue – the highest of the cohort.

(Note: size of circles is proportional to planned annual production of NdPr. For comparison, ARU plans to produce 3,601tpa of NdPr).



Source: ARU

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